Abstract

The present invention involves a system and method of model-based fault detection for a vehicle steer-by-wire system. The method includes providing a steer-by-wire fault detection unit to implement fault detection for the fault occurrence in sensors, actuators, and the controlled plant. The steer-by-wire fault detection unit is composed of a residual generator and decision-making unit. The residual generator generates a series of residual signal which are difference between the estimation signals based on a steer-by-wire controlled plant mathematical model and the actual measurement signals of steer-by-wire controlled plant. The decision making unit determines whether any faults have occurred by applying a fault test rule for residual signals. The fault detection for the steer-by-wire system includes the influence of system uncertainty and nonlinearity, A robust gain scheduling H^{∞} fault detector is implemented to generate residual signals to reduce the effect of system uncertainty and nonlinearity for the residual signals. Therefore, the fault detection system is robust with respect to the model uncertainty, external noise and dynamic gain change, and is sensitive to faults occurrence in the steer-by-wire controlled plant.